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(Reaffirmed 2002)

Indian Standard

METHODS OF DETERMINATION OF GROSS - LIDDED CAPACITY OF OPEN TOP SANITARY CANS

1. Scope — This standard covers the methods of determination of gross-lidded capacity of open top sanitary cans with rigid ends and also with flexing top and bottom ends.

2. Terminology — For the purpose of this standard, the terms and definitions used in IS : 11104-1984 'Glossary of terms relating to open top sanitary cans', shall apply.

3. Determination of Gross-Lidded Capacity

3.1 *General* — All the methods of determining capacity rely on obtaining the mass of water in the can. For cans with a capacity equal to or greater than 400 ml, a correction factor as given in Table 1, can be applied but only if a very precise determination of capacity is necessary.

TABLE 1 TEMPERATURE DEPENDENT CORRECTION FACTORS

Water Temperature, °C	Correction Factor (*F*)
12	1·000 5
14	1·000 8
16	1·001 1
18	1·001 4
20	1·001 8
22	1·002 2
24	1·002 7
26	1·003 3
28	1·003 8
30	1·004 4

3.1.1 *Accuracy of the balances* — The scales used for the weighing of the cans shall be at least as accurate as specified in Table 2.

TABLE 2 BALANCE ACCURACY

Mass of Can (*m*) g (1)	Accuracy g (2)
$m \leqslant 500$	± 0·5
$500 < m \leqslant 2\,500$	± 1·0
$2\,500 < m \leqslant 5\,000$	± 2·5
$5\,000 < m$	± 5·0

3.1.2 *Cans with flexing top and bottom ends* — The development of containers in relatively thin materials has, in some cases, led to the introduction of top/bottom ends with intentional flexibility: these ends are produced in convex shape; after sterilization and cooling, the bow changes to concave similar to other open-top can ends. They are used for large cans on which the body would collapse due to the vacuum produced as a result of hot-filling irrespective of whether they are beaded or not. On account of the changing bow of the ends, the container has no absolute fixed capacity. As long as there is no acceptable method of measuring the capacity of cans with such flexing ends, this capacity has to be considered as equal to the capacity of similar cans with non-flexing ends.

Metal Containers Sectional Committee, MCPD 12 [Ref : Doc : MCPD 12(680)]

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3.2 *Determination of Gross-Lidded Capacity, C, of Empty Can*

Note — The gross capacity is normally determined with empty cans. If the capacity of filled cans has to be determined, the method described in Appendix A can be applied.

3.2.1 Attach one end to the body by the usual method for three-piece cans only.

3.2.2 Drill two holes 3 to 6 mm in diameter and about 7 mm apart, in the loose end of the can from the inside surface outwards (the position of the holes depends on the end profile). In non-round ends, drill the holes as close as possible to a corner radius.

3.2.3 Attach this end to the body by the usual method.

3.2.4 Determine the mass of the empty can, m_1, in grams as exactly as possible (*see* **3.1.1**).

3.2.5 If necessary, measure the temperature of water to be used (*see* **3.1**).

3.2.6 Fill the can with water through one of the holes, with the can inclined at an angle to the vertical so that the holes are as high as possible.

3.2.6.1 When water runs out of the second hole, close the holes with finger, shake the can gently, and complete filling.

3.2.7 If the above filling method results in distortion (due to deformation of the can) then use the following method:

Place the can in a container, filled with water, with the can inclined at an angle to the vertical so that the holes are as high as possible. Fill the can completely with water through one of the holes. The water in the container should be not more than 10 mm below the highest point of the can. Close the holes with small pieces of adhesive tape. Remove the can from the container.

3.2.8 Remove any surplus water from the outside of the can.

3.2.9 Determine the mass of the filled can, m_2, in grams as exactly as possible (*see* **3.1.1**).

3.2.10 The difference between the weighing ($m_2 - m_1$), multiplied by the relevant correction factor (*see* **3.1**), if necessary, represents the gross-lidded capacity, *C*, in millilitres.

APPENDIX A

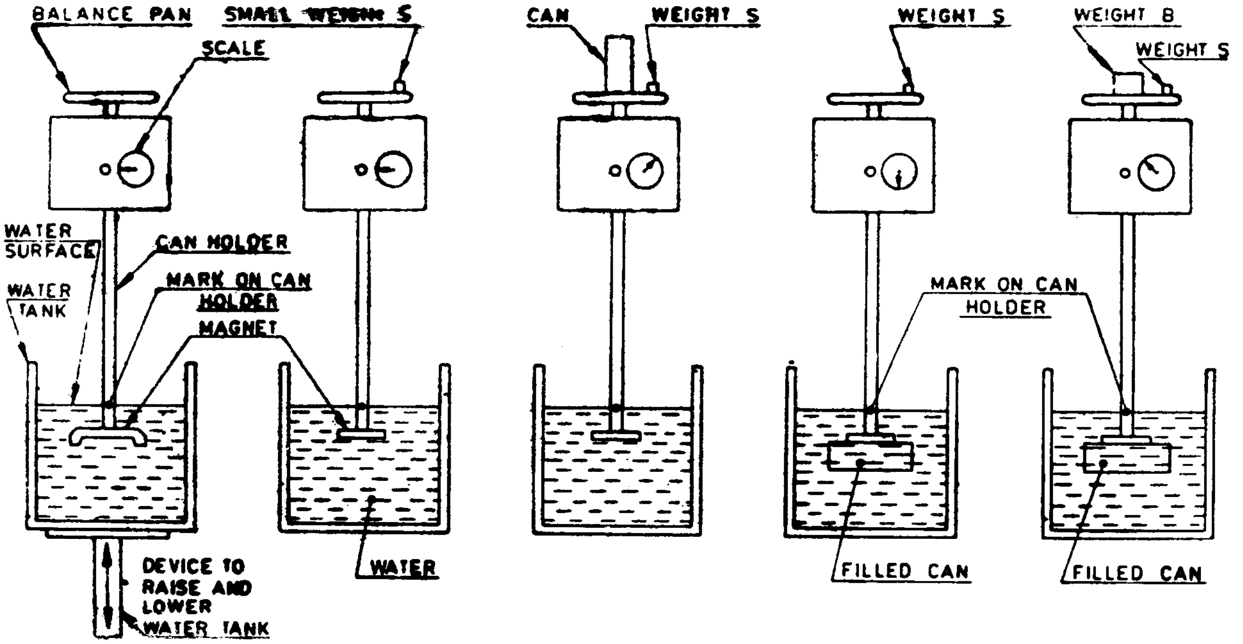
(*Clause* 3.2)

DETERMINATION OF GROSS-LIDDED CAPACITY (CAN FILLED WITH THE PRODUCT)

A-1. Apparatus

A-1.1 *Top-Loading Balance — see* Fig. 1A.

Note — The double-pan torsion type of balance is not an acceptable substitute.



1A Top Loading Balance With Water Tank

1B Initial Zeroing of the Balance

1C For Mass of the Filled Can in Air

1D For Mass of the Filled Can in Water

1E For Mass of the Filled Can Floating in Water

FIG. 1 SEQUENCE OF WEIGHING

A-1.2 *Water Tank* — The level and the contents of the water tank shall be adjustable. The tank shall be large enough to hold a submerged can without overflowing.

A-2. Method

A-2.1 The can to be tested shall be free from dents or buckles.

A-2.2 Fill the tank, to a suitable level, with water.

A-2.3 Measure the temperature of the water, if a correction factor is to be applied (*see* **3.1**).

A-2.4 Zero the balance with the water level adjusted to the mark on the can holder, by means of a small weight, *S*, set on the balance pan (*see* Fig. 1B) and which shall stay here during the further operations.

A-2.5 Vent the can to the atmosphere. It may be necessary to make a small hole to do this. Seal any such hole with adhesive tape.

A-3. Determination of Mass of Filled Can in air (m_{fa})

A-3.1 Place the filled can on the balance pan.

A-3.2 Adjust the tank to bring the water level to the mark (*see* Fig. 1C).

A-3.3 Read the mass of the filled can, m_{fa}, in grams as accurately as the scale permits.

A-4. Determination of Mass of Filled Can in Water (m_{fw})

A-4.1 Attach the filled can to the magnet under water (*see* Fig. 1D). Avoid trapping any air.

Note — If the magnet does not hold the can, it will necessary to bind the can to the magnet. In this case, start again at **A-2.4** with the binding wire attached to the magnet.

A-4.2 If the filled can floats in water, add weights *B* (*see* Fig. 1E) to the balance pan until a positve reading is seen on the scale.

A-4.3 Adjust the tank to bring the water level to the mark (*see* Fig. 1D or 1E).

A-4.4 Read the mass of the can on the scale in grams. For cans which do not float in water the reading is m_{fw} For cans which do float in water, m_{fw} shall have a value equal to the scale reading minus *B*. Note that in this latter case, m_{fw} will be negative.

A-5. Determination of Mass of Empty Can in Air (m_{ea})

A-5.1 Open the can, remove the contents and wash and dry the can.

A-5.2 Place the complete, empty can on the balance pan.

A-5.3 Adjust the tank to bring the water level to the mark (*see* Fig. 1C).

A-5.4 Read the mass of the can, m_{ea}, in gram as accurately as the scale permits.

A-6. Determination of Mass of Empty Can in Water (m_{ew})

A-6.1 Attach the complete, empty can to the magnet under water. Avoid entrapping any air.

A-6.2 Adjust the tank to bring the water level to the mark (*see* Fig. 1D).

A-6.3 Read the mass of the can, m_{ew}, in grams.

A-7. Calculation of the Gross-Lidded Capacity of the Can — The gross-lidded capacity of the can, *C*, filled with the product, in millilitres, is calculated using the following equation:

$$C = F[(m_{fa} - m_{fw}) - (m_{ea} - m_{ew})]$$

where

F = correction factor to be used, if necessary (*see* **3.1**);
m_{fa} = mass of the filled can in air, in grams (*see* **A-3**);
m_{fw} = mass of the filled can in water, in grams (*see* **A-4**);
m_{ea} = mass of the empty can in air, in grams (*see* **A-5**); and
m_{ew} = mass of the empty can in water, in grams (*see* **A-6**).

EXPLANATORY NOTE

This standard is supplementary to IS : 11104-1984 'Glossary of terms relating to open top cans' and supersedes IS : 6093-1971 'Method of determining sanitary capacity and dimensions of hermetically sealed metal food containers'.

This standard is based on ISO 90/1-1986 'Light gauge metal containers—Definitions and determination methods for dimensions and capacity Part 1: Open-top cans', issued by the International Organization for Standardization (ISO). It not only covers the determination of gross-lidded capacity of empty cans but also that of cans filled with a product and the cans with flexing top and bottom ends also.

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